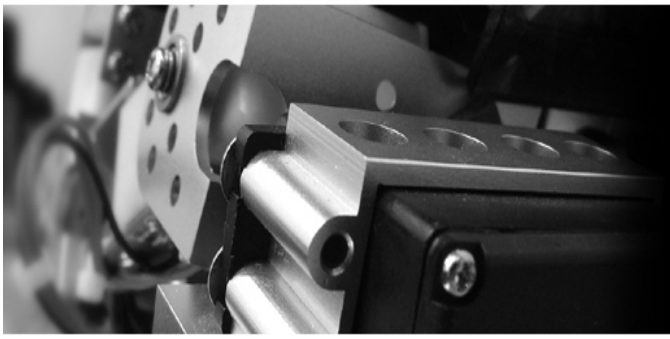
v1.0



Closer to Real, ROBOTIS

USB2Dynamixel

User's Manual

ROBOTIS CO.,LTD. www.robotis.com

Table of Contents

1. Product Introduction · · ·

1. Product Introduction

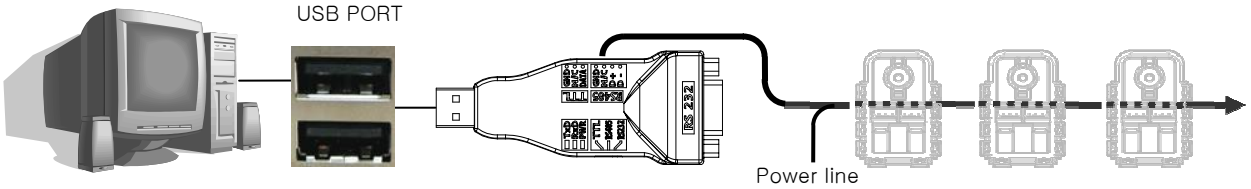
1-1. Product Features

USB2Dynamixel is a device that can directly control Dynamixel from PC. 3P connector and 4P connector are built-in, allowing USB2Dynamixel to connect to various Dynamixels and it is used by connecting to a USB port.

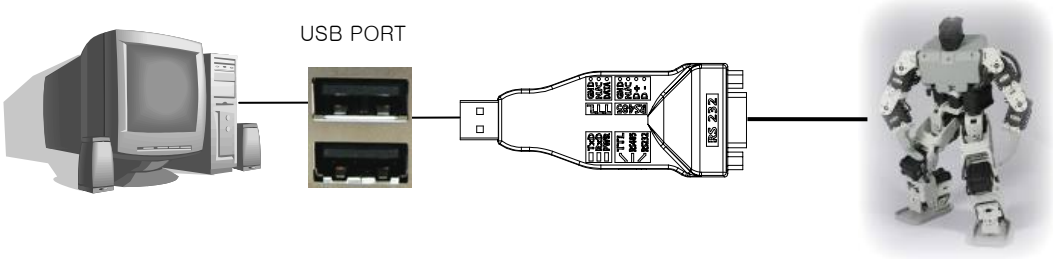
Moreover, USB2Dynamixel can be used in a notebook or in PC that has no serial port by converting a USB port to a serial port. This capability allows users to connect Bioloid robot' s CM 5 to a USB port or by connecting ZIG2Serial to the same port to control the robot remotely. The following pictures illustrate how to use USB2Dynamixel.

.

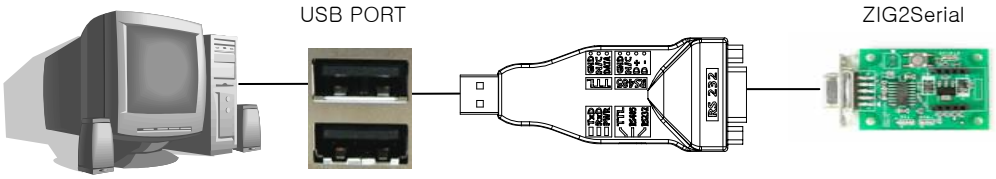
◎ DYNAMIXEL CONTROL USING PC



◎ Conversion of serial port



◎ Wireless communication



1-2. Product Components

◎ USB2Dynamixel

Use to directly operate Dynamixel from PC.
Or when converting a USB port to a serial port.

◎ Software

Inside the software, drivers and utilities are provided so that users can directly operate Dynamixel from PC. You can download it from Homepage. (www.robotis.com)

◎ Manual

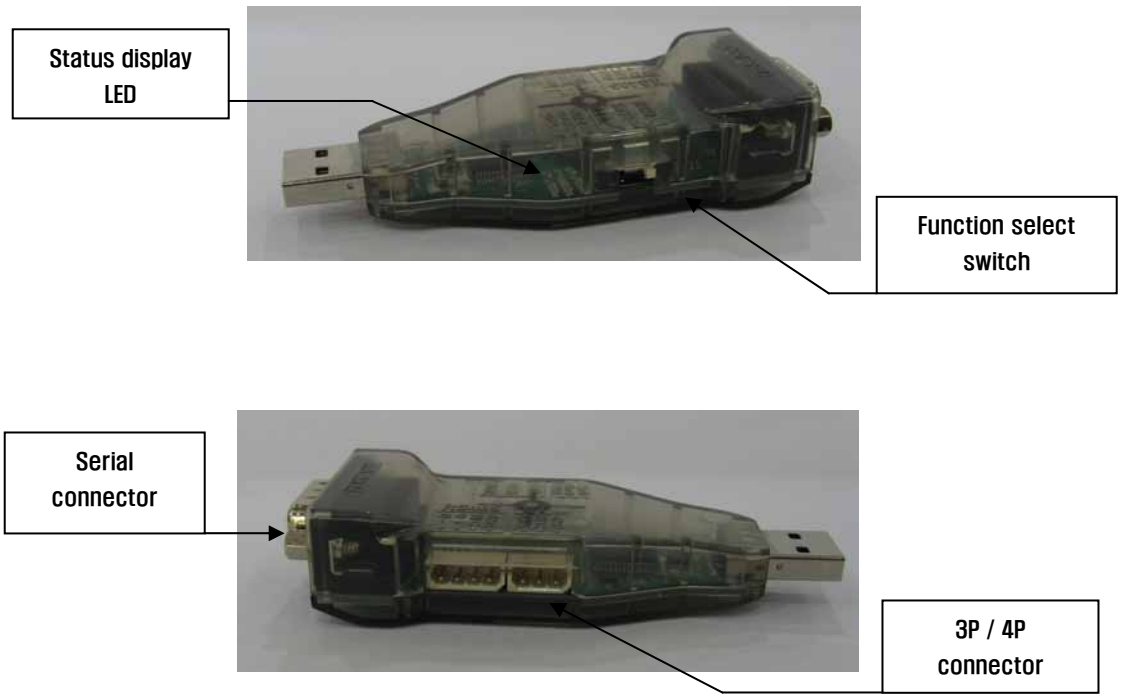
This printed manual explains how to install drivers and utilities, as well as usage method for USB2Dynamixel.

1-3. System Requirements

◎ PC : IBM Compatible PC (Required)
USB 1.1 or higher (Required)
◎ OS : Windows 2000 or Windows XP (Required)
◎ CPU : Intel Pentium III 1GHz , AMD Athlon XP 1GHz or higher (Recommended)
◎ RAM : 256MB or higher (Recommended)

1-4. USB2Dynamixel Connection

1-4-1. USB2Dynamixel Components



Status display LED	:	Displays power status, TxD(data write), and RxD(data read).
Function select switch	:	Allows the selection of TTL, RX-485, or RX-232
3P connector	:	Connects to the AX series Dynamixel via TTL.
4P connector	:	Connects to the DX, RX series Dynamixel via RX-485.
Serial connector	:	Converts a USB port to a serial port via RX-232.

1-4-2. CONNECTING AX SERIES DYNAMIXEL

Set the function select switch to TTL mode.

Connect 3P cable to the 3P connector of USB2Dynamixel and Dynamixel connector (either one can be connected).

By using the 3P cable, Dynamixel can be daisy chained.

Lastly, connect Dynamixel to a power line.

POWER (DC 7~10V)

warning

USB2Dyanmixel does not provide power to the Dynamixel. For further details on power source, refer to the chapter 1-4-6.

1-4-3. CONNECTING DX / RX SERIES DYNAMIXEL

Set the function select switch to RS 485 mode.

Connect 4P cable to the 4P connector of USB2Dynamixel and Dynamixel connector (either one can be connected).

By using the 4P cable, Dynamixel can be daisy chained.

Lastly, connect Dynamixel to a power line.

POWER (DC15~17V)

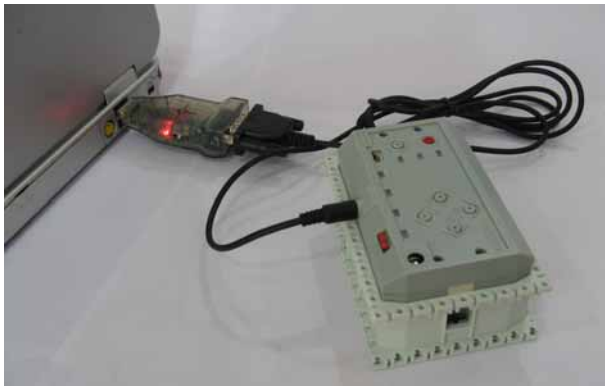
warning

USB2Dyanmixel does not provide power to the Dynamixel. For further details on power source, refer to the chapter 1-4-6.

1-4-4. CONVERTING USB PORT TO SERIAL PORT

By converting a USB port to a serial port, USB2Dynamixel can be used in a notebook or in PC that does not have a serial port.

Set the function select switch to RS 232 mode.



CM-5 uses a serial port to communicate. By using USB2Dynamixel, users can communicate with CM-5 via USB port. For more details, refer to the Bioloid manual.

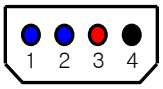
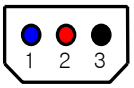
By using USB2Dynamixel, users can also use ZIG2Serial as a USB port without the separate need for power source. For more details, refer to the ZIG2Serial manual.

warning Do not connect to a device that consumes more than 500mA. It can damage USB board.

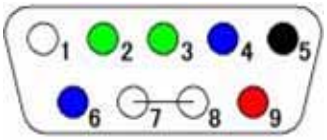
1-4-5. Pin Figure

The following illustration shows the connector pins used in USB2Dynamixel. Users can use the pins in accordance with their needs.

Pin Figure of MOLEX Cable connector

4 Pin			3 Pin		
Pin No.	Signal	Pin Figure	Pin No.	Signal	Pin Figure
1	DATA - (RS-485)		1	DATA (TTL)	
2	DATA + (RS-485)		2	NOT Connected	
3	NOT Connected		3	GND	
4	GND				

Pin Figure of Serial Connector

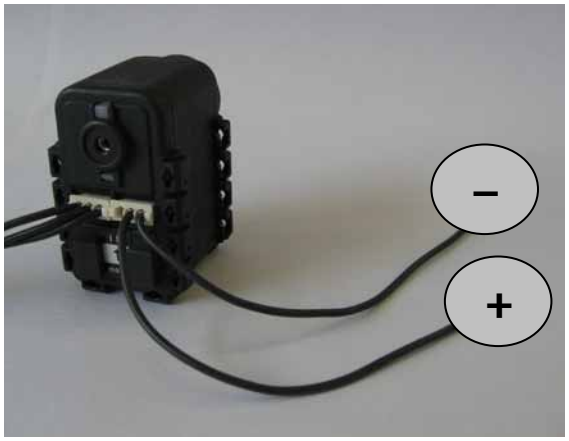
Pin No.	Signal	Pin Figure
1	Data (TTL)	
2	RXD (RS-232)	
3	TXD (RS-232)	
4	D+ (RS-485)	
5	GND	
6	D- (RS-485)	
7	Short the 8th pin	
8	Short the 7th pin	
9	USB power (5V)	

warning Do not connect to a device that consumes more than 500mA. It can damage USB board.

1-4-6. The methord of inputting power

USB2Dyanmixel does not provide power to the Dynamixel. in order to drive dynamixels, the power should be provided as following methords. Indivisual appropriated power supply (eg. Ax/DX/RX series) is described at the dynamixel manuals.

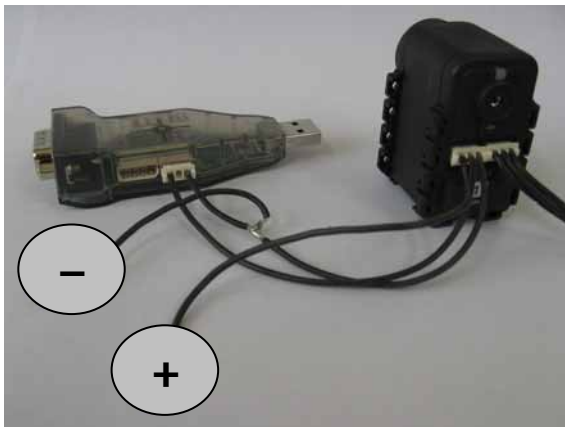
Tips on inputing Power (AX seriesDynamixel)



● Input power into the last Dynamixel

Divide the 1st cable, data cable, with connector (refer to the chapter 1-4-5).

Input the positive (+) power into the 2nd cable and the negative (-) power to the 3rd cable.



● Input power into the first Dynamixel

If you cannot input power to the last dynamixel, input the power into the first dynamixel.

Divide the 2nd cable with the connector (refer to the chapter 1-4-5) and then connect it with positive(+) power.

Join the 3th cable to another cable and connect it with negative (-) power

Tips on inputing Power (DX/RX seriesDynamixel)

● Input power into the last Dynamixel

Divide the 1st, 2nd cable, data cables, with connector (refer to the chapter 1-4-5).

Input the positive (+) power into the 3rd cable and the negative (-) power to the 4th cable.

● Input power into the first Dynamixel

If you cannot input power to the last dynamixel, input the power into the first dynamixel.

Divide the 2nd cable with the connector (refer to the chapter 1-4-5) and then connect it with positive(+) power.

Join the 3th cable to another cable and connect it with negative (-) power

1 – 5 . Installation

1 – 5 – 1 . Driver Installation

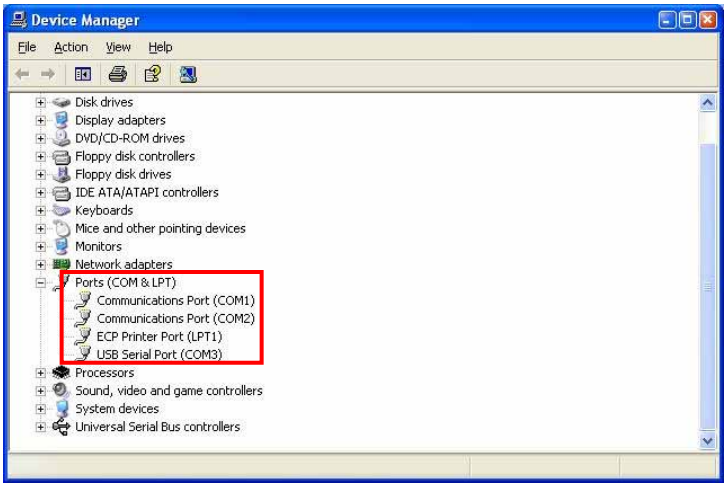
< Step 1 > When USB2Dynamixel is connected to PC the following "New Hardware" dialog window will appear, here, users select "Install from a list of specific location.

< Step 2 > After selecting search location, select USB2Dynamixel driver folder.

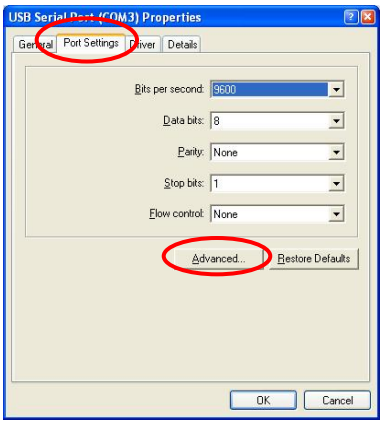
< Step 3 > Complete the installation..

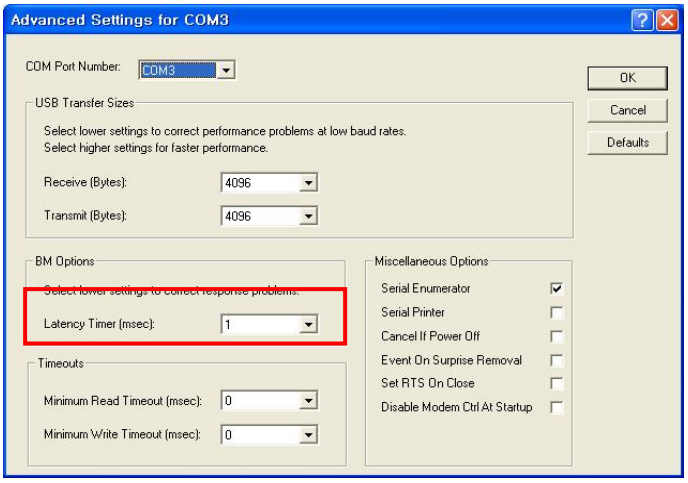
< Step 4 > Another "New Hardware" dialog window appears, repeat the Step 1~3 again.

< Step 5 > From the Device Manager, check where the USB2Dynamixel driver is installed. For communication connection later on, remember the Port Number (COM x).



< Step 6 > After checking driver information, change "Latency Timer" to 1ms. This change allows for the fast response time.

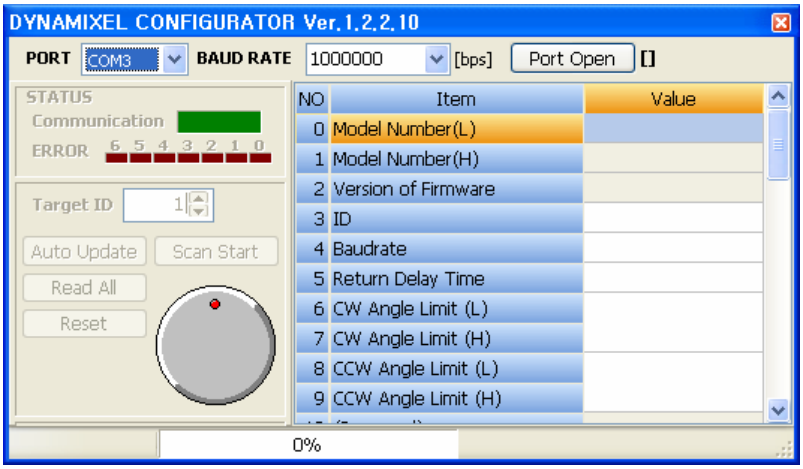




1-5-2. Dynamixel Configurator Installation

< Step 1 > Download Dynamixel Configurator from ROBOTIS Homepage.

< Step 2 > Install your PC.

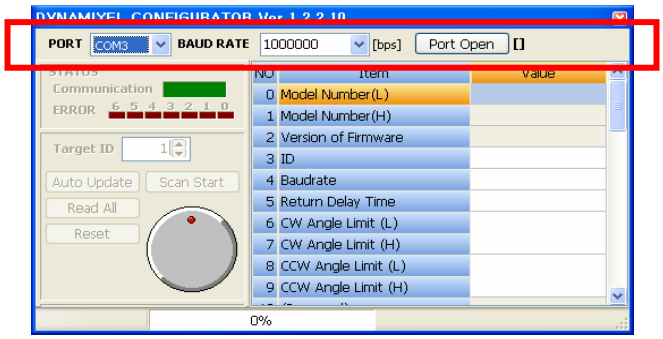


2. Operation of Dynamixel

Dynamixel Configurator is a utility that enables users to check the movement of Dynamixel from PC. It can also change the values of Dynamixel.

As the basic concept of Dynamixel is represented visually, users can easily understand the usage method and test the various applications

2-1. Communication



◎ PORT

Users can select port for USB2Dynamixel communication. Select the port that was chosen during the driver installation.

◎ BAUD RATE

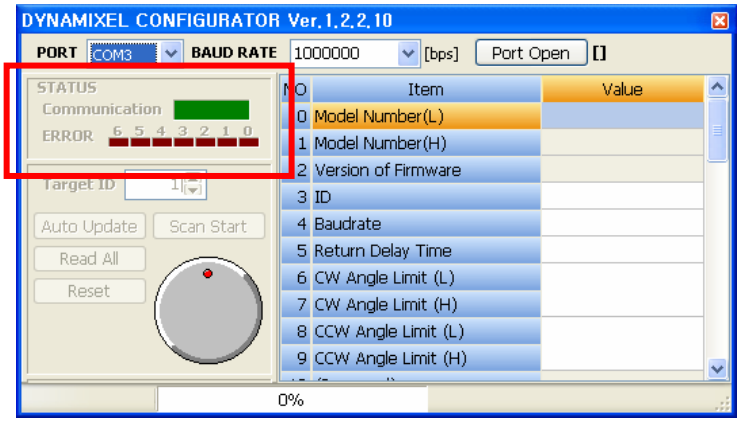
The following table shows the data value. If the baud rate error is within 3%, there will be no problem with the communication.

Set BPS	Goal BPS	Error
1000000.0	1000000.0	0.000%
500000.0	500000.0	0.000%
400000.0	400000.0	0.000%
250000.0	250000.0	0.000%
200000.0	200000.0	0.000%
117647.1	115200.0	-2.124%
57142.9	57600.0	0.794%
19230.8	19200.0	-0.160%
9615.4	9600.0	-0.160%

◎ PORT OPEN/CLOSE

Use this to turn on and off communication. It toggles OPEN / CLOSE with the mouse click.

2-2. Status Display



◎ STATUS

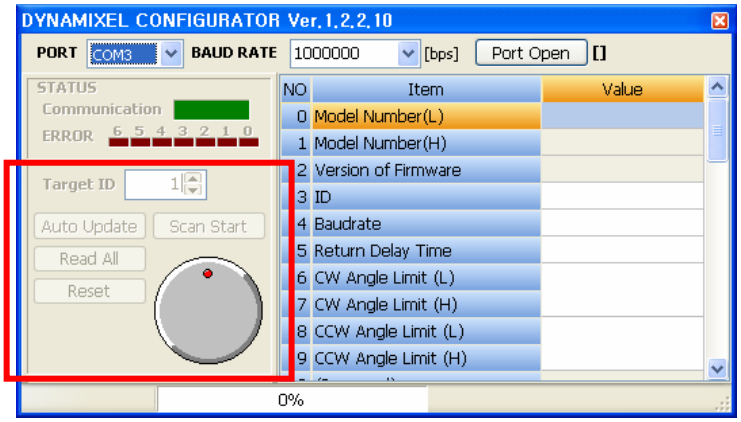
It displays the communication status. When the signal is being sent, it displays "Sending" and when the communication is completed, it displays "Ok."

◎ ERROR

When there is an error, red light will be turned on corresponding to the error. The following table shows the details of error.

No	Error	Reason
6	Instruction Error	When non-defined instruction is sent; or when action command without the reg_write is transmitted.
5	Overload Error	When specified maxium torque cannot control the current load level.
4	Checksum Error	When transferred instruction packet does not match with Checksum.
3	Range Error	When it exceeds the allowable usage range.
2	Overheating Error	When the internal temperature of Dynamixel exceeds the set temperature range in a control table.
1	Angle Limit Error	When the goal position value of CW Angle Limit ~ CCW Angle Limit is written outside of range values.
0	Input Voltage Error	When input voltage exceeds the set voltage range in a control table.

2-3. Operation Command Input



◎ TRAGET ID

Select the iD of Dynamixel that will be operated. The ID is assigned to identify each Dynamixel. Connected Dynamixels must have unique iDs.

◎ AUTO UPDATE

When Auto Update button is clicked, as soon as the value of item is changed, Dynamixel will be updated.

◎ SCAN START

It exams the Dynamixel ID connected to a USB port and the Baud Rate.

◎ READ ALL

It reads the current condition of Dynamixel.

◎ RESET

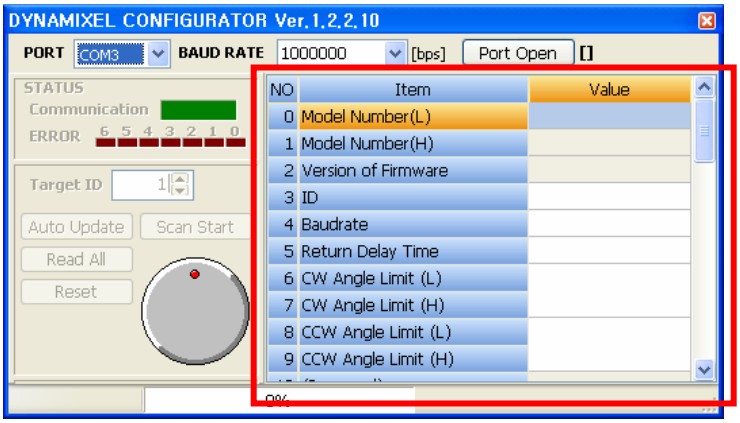
It resets Dynamixel to factory initial setting.

◎ DIAL

Users can input the location value of Dynamixel. Also, users can set the command angle visually.

2-4. Items & Values

In Dynamixel Configurator, there are 37 items where users can select to set Dynamixel. The following picture shows the main items. For more details, refer to the Dynamixel manual.



◎ ID

ID is a unique number that identifies each Dynamixel. Here, users can set the value to change the ID of Dynamixel.

◎ BAUDRATE

Set the communication speed. For more details, refer to the Chapter 2-1-1.

◎ CW/CCW ANGLE LIMIT

Set angle area allowing the limit of Dynamixel movement range. Goal position must be set within CW Angle Limit ≤ Goal Potion ≤ CCW Angle Limit and if it exceeds the range, Angle Limit Error occurs.

◎ ALARM LED

When an error occurs and applicable bit is set to 1, the LED of dynamixel will blink. For more details on errors, refer to the Chapter 2-1-2.

◎ GOAL POSITION

Users input the location where they want Dynamixel to move to.

2-5. Control Table

The following table shows the address and the value range of Dynamixel. For further details, check the Dynamixel manual.

	Address	Item	Access	Initial Value
EEPROM Area	0(0X00)	Model Number(L)	RD	?
	1(0X01)	Model Number(H)	RD	?
	2(0X02)	Version of Firmware	RD	?
	3(0X03)	ID	RD,WR	1(0x01)
	4(0X04)	Baud Rate	RD,WR	34(0x22)
	5(0X05)	Return Delay Time	RD,WR	250(0xFA)
	6(0X06)	CW Angle Limit(L)	RD,WR	0(0x00)
	7(0X07)	CW Angle Limit(H)	RD,WR	0(0x00)
	8(0X08)	CCW Angle Limit(L)	RD,WR	255(0xFF)
	9(0X09)	CCW Angle Limit(H)	RD,WR	3(0x03)
	10(0x0A)	(Reserved)	-	0(0x00)
	11(0X0B)	the Highest Limit Temperature	RD,WR	85(0x55)
	12(0X0C)	the Lowest Limit Voltage	RD,WR	60(0X3C)
	13(0X0D)	the Highest Limit Voltage	RD,WR	240(0xF0)
	14(0X0E)	Max Torque(L)	RD,WR	255(0XFF)
	15(0X0F)	Max Torque(H)	RD,WR	3(0x03)
	16(0X10)	Status Return Level	RD,WR	2(0x02)
	17(0X11)	Alarm LED	RD,WR	4(0x04)
	18(0X12)	Alarm Shutdown	RD,WR	4(0x04)
	19(0X13)	(Reserved)	RD,WR	0(0x00)
	20(0X14)	Down Calibration(L)	RD	?
	21(0X15)	Down Calibration(H)	RD	?
	22(0X16)	Up Calibration(L)	RD	?
	23(0X17)	Up Calibration(H)	RD	?
RAM Area	24(0X18)	Torque Enable	RD,WR	0(0x00)
	25(0X19)	LED	RD,WR	0(0x00)
	26(0X1A)	CW Compliance Margin	RD,WR	0(0x00)
	27(0X1B)	CCW Compliance Margin	RD,WR	0(0x00)
	28(0X1C)	CW Compliance Slope	RD,WR	32(0x20)
	29(0X1D)	CCW Compliance Slope	RD,WR	32(0x20)
	30(0X1E)	Goal Position(L)	RD,WR	[Addr36]value
	31(0X1F)	Goal Position(H)	RD,WR	[Addr37]value
	32(0X20)	Moving Speed(L)	RD,WR	0
	33(0X21)	Moving Speed(H)	RD,WR	0
	34(0X22)	Torque Limit(L)	RD,WR	[Addr14] value
	35(0X23)	Torque Limit(H)	RD,WR	[Addr15] value
	36(0X24)	Present Position(L)	RD	?
	37(0X25)	Present Position(H)	RD	?
	38(0X26)	Present Speed(L)	RD	?
	39(0X27)	Present Speed(H)	RD	?
	40(0X28)	Present Load(L)	RD	?
	41(0X29)	Present Load(H)	RD	?
	42(0X2A)	Present Voltage	RD	?
	43(0X2B)	Present Temperature	RD	?
	44(0X2C)	Registered Instruction	RD,WR	0(0x00)
	45(0X2D)	(Reserved)	-	0(0x00)
	46(0x2E)	Moving	RD	0(0x00)
	47(0x2F)	Lock	RD,WR	0(0x00)
	48(0x30)	Punch(L)	RD,WR	32(0x20)
	49(0x31)	Punch(H)	RD,WR	0(0x00)

The initial value of table can be different depending on the Dynamixel models.